PATENT APPLICATION
PO-8155
MD-04-18

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION OF EDWARD P. BROWNE SERIAL NUMBER: 10/804,894 FILED: MARCH 19, 2004 TITLE: STARTER FEED STREAM ACIDIFICATION IN DMC-CATALYZED PROCESS	GROUP NO.: 1712 EXAMINER: MICHAEL J. FEELY

REVISED APPEAL BRIEF UNDER 37 C.F.R. §1.192

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Commissioner for Patents
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Sir:

The present Appeal Brief is submitted in support of the Notice of Appeal filed September 11, 2007 and in response to the Notifications of Non-Compliant Appeal Brief, PTOL-462, mailed January 17, 2008 and May 20, 2008. A separate Petition For Extension of Time is being filed simultaneously herewith.

As a preliminary matter, the Examiner states at page 2 of the Notification of Non-Compliant Appeal Brief, PTOL-462 mailed January 17, 2008 and May 20, 2008, that the Brief contains a section heading titled "CONCLUSIONS" which puts the remaining headings in improper order. Appellant fails to understand how the complained of section headings are thrown out of "proper" order by the inclusion of a "Conclusions" heading between the required "Arguments" heading and the required "Claims Appendix", "Evidence Appendix" and "Related Proceedings Appendix" which still follow in their proper order. Appellant has again reviewed 37 C.F.R. §41.37(c) and has again located a list of headings that **must be** contained in the Brief, but has failed to locate a prohibition on the use of additional section headings or a list of improper or otherwise prohibited headings as the Examiner appears to infer.

Further, 37 C.F.R. §41.37(c)(1) explicitly states that the brief "shall" include a list of headings, rather than the more limited expression, "shall only" include the headings listed therein, as the Examiner appears to believe. Appellant respectfully requests the Board instruct the Examiner to provide Appellant with an exact citation to the Rules in support of his position or to withdraw his remark from the Record. In the interest of avoiding further delays in the prosecution of the instant application, the Appellant herewith submits this revised appeal brief in an attempt to comply with the Examiner's instructions.

At page 2 of the Notification of Non-Compliant Appeal Brief, PTOL-462 mailed May 20, 2008, the Examiner also stated the Brief was defective because it was unsigned. Appellant's attorney respectfully apologizes for the clerical error.

As a further preliminary matter, at page 3 of the Notification of Non-Compliant Appeal Brief, PTOL-462 mailed January 17, 2008, the Examiner states that the Information Disclosure Statement filed December 3, 2007 fails to comply with 37 C.F.R. §1.98(a)(1). Appellant was merely submitting the Singapore examination report (conducted by the Danish Patent Office) indicating patentability of the claimed invention for the Examiner's consideration.

I. REAL PARTY IN INTEREST

The real party in interest for the present Application Serial No. 10/804,894 is Bayer MaterialScience LLC of Pittsburgh, Pennsylvania, by virtue of the assignments executed April 14, 2004 and June 30, 2004.

II. RELATED APPEALS AND INTERFERENCES

On September 11, 2007, a Notice of Appeal was filed in Application Serial No. 10/804,894. There are no pending appeals or interferences of which Appellant is aware that would be affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Appellant herewith appeals the final rejection of Claims 1-16, 18, 19, 33 and 34. Claims 1-16, 18, 19, 33 and 34 are pending and stand rejected. Claims 17 and 20-32 have been canceled. A complete copy of the appealed claims is set forth in the Appendix. Claims 1-16, 18, 19, 33 and 34 are the subject of this Appeal Brief.

IV. STATUS OF AMENDMENTS AFTER FINAL

No Amendment under 37 CFR § 1.116 has been filed in the instant application.

V. SUMMARY OF CLAIMED SUBJECT MATTER

As recited in independent Claim 1, the present invention relates to a process for the polyoxyalkylation of a starter (found at page 7, lines 18-19) comprising establishing oxyalkylation conditions in an oxyalkylation reactor (found at page 7, lines 19-20) in the presence of a double metal cyanide (DMC) catalyst (found at page 7, lines 20-21); continuously introducing into the reactor at least one alkylene oxide (found at page 7, lines 21-22) and a low molecular weight starter (found at page 7, line 22) acidified with at least one of an inorganic protic mineral acid (found at page 7, lines 22-23) and an organic acid (found at page 7, line 23), wherein the acid comprises greater than 100 ppm, based on the weight of the starter (found at page 7, lines 24-25); and recovering an oxyalkylated low molecular weight starter polyether product (found at page 7, lines 25-26) having a number average molecular weight of about 260 Daltons (Da) to about 2,500 Da (found at page 10, line 4).

Further, as recited in independent Claim 33, the present invention also relates to an improved process of producing a polyurethane (found at page 17, line 3) by the reaction of at least one isocyanate (found at page 17, line 2) and at least one isocyanate reactive compound (found at page 17, lines 1-2), the improvement comprising producing the isocyanate reactive compound by establishing oxyalkylation conditions in an oxyalkylation reactor (found at page 7, lines 19-20) in the presence of a double metal cyanide (DMC) catalyst (found at page 7, lines 20-21), continuously introducing into the reactor at least one alkylene oxide (found at

page 7, lines 21-22) and a low molecular weight starter (found at page 7, line 22) acidified with at least one of an inorganic protic mineral acid (found at page 7, lines 22-23) and an organic acid (found at page 7, line 23), wherein the acid comprises in excess of 100 ppm, based on the weight of the low molecular weight starter (found at page 7, lines 24-25) and recovering an oxyalkylated low molecular weight starter polyether product (found at page 7, lines 25-26) having a number average molecular weight of about 260 Daltons (Da) to about 2,500 Da (found at page 10, line 4).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-10, 13-16, 18, 19, 33 and 34 stand rejected under 35 U.S.C. §102(b) as being anticipated by, or in the alternative under 35 U.S.C. §103(a) as being rendered obvious by U.S. Pat. No. 6,359,101 issued to O'Connor et al. With respect to this ground of rejection, Appellant admits that Claims 1-10, 13-16, 18, 19, 33 and 34 stand or fall together.
2. Claims 1-16, 18, 19, 33 and 34 stand rejected under 35 U.S.C. §103(a) as being rendered obvious by U.S. Pat. No. 6,077,978 issued to McDaniel et al. With respect to this ground of rejection, Appellant admits that Claims 1-16, 18, 19, 33 and 34 stand or fall together.
3. Claims 11 and 12 stand rejected under 35 U.S.C. §103(a) as being rendered obvious by U.S. Pat. No. 6,359,101 issued to O'Connor et al. in view of U.S. Pat. No. 6,077,978 issued to McDaniel et al. With respect to this ground of rejection, Appellant admits that Claims 11 and 12 stand or fall together.

VII. ARGUMENT

As will be set forth in detail below, Claims 1-10, 13-16, 18, 19, 33 and 34 are neither anticipated nor rendered obvious by U.S. Pat. No. 6,359,101 issued to O'Connor et al. Further, Claims 1-16, 18, 19, 33 and 34 are not rendered obvious by U.S. Pat. No. 6,077,978 issued to McDaniel et al. Finally, Claims 11 and 12 are not rendered obvious by U.S. Pat. No. 6,359,101 issued to O'Connor et al. in view of U.S. Pat. No. 6,077,978 issued to McDaniel et al. Accordingly the rejections under 35 U.S.C. §§102(b) and 103(a), should be reversed, and favorable action by the Board is respectfully requested.

A. The Rejections under 35 U.S.C. §§102(b)/103(a) over O'Connor et al. are Improper

Claims 1-10, 13-16, 18, 19, 33 and 34 have been rejected under 35 U.S.C. §102(b), as being anticipated by, or in the alternative as rendered obvious, under 35 U.S.C. §103(a) by U.S. Pat. No. 6,359,101 issued to O'Connor et al. As will be set forth below, Appellant submits that Claims 1-10, 13-16, 18, 19, 33 and 34 are neither anticipated, nor rendered obvious, by the teachings of O'Connor et al. and the rejections thereof should be reversed.

1. The Examiner's Rationale

The Examiner has alleged at page 3, paragraph numbered 6 of the Final Office Action mailed June 14, 2007 that,

> ***Regarding Claims 1, 5-10, 13-16, 18. and 19***, O'Connor et al. disclose: ***(1)*** a process for the polyoxyalkylation of a starter (Abstract; column 1, lines 5-18), comprising:
>
> (a) establishing oxyalkylation conditions in an oxyalkylation reactor in the presence of a DMC catalyst (Abstract; column 14, line 15 through column 15, line 62; Examples);
>
> (b) continuously introducing into the reactor at least one alkylene oxide and a low molecular weight starter (Abstract; column 3, line 58 through column'6, line 2) acidified with at least one of an inorganic protic mineral acid, and an organic acid, wherein the acid comprises greater than 100 ppm, based on the weight of the starter (column 10, lines 57-64; Examples); ***(5)*** wherein the acid is chosen from *see claim for list* (column 10, lines 57-64; Examples); ***(6)*** wherein the acid is chosen from *see claim for list* (column 10, lines 57-64; Examples); ***(7)*** wherein the acid is phosphoric acid (column 10, lines 57-64; Examples); ***(8)*** wherein the acid comprises greater than 100 ppm to about 2,000 ppm, based on the weight of the starter (column 10, lines 57-64; Examples); ***(9)*** wherein the acid comprises about 200 ppm to about 300 ppm, based on the weight of the starter (column 10, lines 57-64; Examples); ***(10)*** wherein the reactor is a continuous reactor (column 14, line 15 through column 15, line 62); ***(13)*** wherein the continuous reactor comprises a back-mixed reactor (column 14, line 15 through column 15, line 62); ***(14)*** wherein the DMC catalyst is zinc hexacyanocobaltate (column 12, line 43 through column 13, line 30 - *see referenced documents in this passage);* ***(15)*** wherein the alkylene oxide is *see claim for list* (Abstract; column 3, line 58 through column 6, line 2; Examples); ***(16)*** wherein the alkylene oxide is propylene oxide (Abstract; column 3, line 58 through column 6, line 2); ***(18)*** wherein the process is continuous (column 14, line 15 through column 15, line 62); and ***(19)*** wherein the process is semi-batch (column 14, line 15 through column 15, line 62).

O'Connor et al. disclose, "These polyols can range in molecular weight from 300 to 30,000," (see column 13, line 55 through column 14, line 14); however, they do not explicitly disclose the claimed molecular weight range of about 260 Da to about 2,500 Da.

Firstly, it has been found that when a claimed range, "overlap(s) or lie(s) inside ranges disclosed by the prior art" a *prima facie* case of obviousness exists - *see MPEP 2144.05*. Secondly, it should be noted that the O'Connor et al. reference satisfies all of the process limitations set forth in the instant claims. In light of this, one of ordinary skill in the art would have expected to inherently produce the same or obvious results from the same or obvious process.

Therefore, the teachings of O'Connor et al. would have inherently or obviously satisfied the instant invention because they disclose the same process limitations set forth in the instant claims, wherein one of ordinary skill in the art would have expected to inherently produce the same or obvious results from the same or obvious process. Furthermore, they disclose a molecular weight range that overlaps the molecular weight range set forth in the instant claims.

Regarding Claims 2-4, the starter materials set forth in the claims are recognized as nonpreferred materials in O'Connor et al - *see column 10; lines 30-38; column 11, lines 44-55*. However, it has been found that, "The use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned. They are part of the literature of the art, relevant for all they contain," -*In re Heck*, 699 F.2d 133 1, 1332-33,216 USPQ 1038, 1039 (Fed. Cir. 1983) (quoting *In re Lemelson*, 397 F.2d.1006, 1009,158 USPQ 275,277 (CCPA 1968)). *See*: *MPEP 2123*.

Therefore, the limitations of claims 2-4 are obviously or inherently satisfied because O'Connor et al. consider these starter materials as non-preferred embodiments.

Regarding- Claims 33 and 34, the teachings of O'Connor et al. are as set forth above and incorporated herein to satisfy the limitations of claims 20-31, 33, and 34.

2. The Claimed Processes are Patentably Distinguishable from the Cited Reference

Appellant disputes the Examiner's assertions regarding O'Connor et al. and respectfully remind the Board that as stated in *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987), "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Further, "[t]he

identical invention must be shown in as complete detail as is contained in the ...claim." *Richardson v. Suzuki Motor Co.,* 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989). Appellant avers that the Examiner has failed to point to where O'Connor et al. do so.

Further, obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so. The teaching, suggestion, or motivation must be found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Kahn*, 441 F.3d 977, 78 USPQ2d 1329 (Fed. Cir. 2006; *In re Lee,* 277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992); and *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

Appellant begins by noting that all of the examples provided by O'Connor et al. apply to processes that are not commercially viable. O'Connor et al. use ratios of propylene oxide to starter in the range of >1 to about 10, whereas commercially viable processes use ratios in the range of about .05 to 0.2. Further, although O'Connor et al. allude to some special reactor at col. 15, lines 21-47 that may be useful for their process as a starter reactor, they do not describe this reactor in any way. As those skilled in the art are aware, the problem with such a high ratio, as is taught by O'Connor et al., is that once the system activates the propylene oxide generates about 7-8°C exotherm for each one percent oxide in the reactor. Thus, if a ratio of 0.1 (10%) is used, a potential temperature increase in the range of 70-80°C would be expected. If one were to use a ratio of 1.0 (50%) PO, the exotherm would be in the range of about 350°C to about 400°C above the starting temperature of the reactor.

As those skilled in the art are aware, at temperatures greater than about 320°C, the polyol being produced would start to exothermically decompose into smaller molecules creating pressure sufficient to rupture the reactor. O'Connor et al. themselves point out the issue of high temperature in their small reactor at the same time it was operating in an unsafe condition (see Table 6 and col. 13, lines 13-18, particularly the reference to the uncontrolled exotherm at col. 13, lines 17-18). In such a small reactor, the reactor mass to heat-evolved is sufficient to allow operation

outside of the safety envelope of commercial systems. However, commercial systems are sufficiently large as to behave like adiabatic reactors and thus the potential for heat evolution must be more carefully controlled than is the case in O'Connor et al.

Thus, because they were operating in a nonviable region, it is difficult to draw any useful conclusions based on the data given in the O'Connor et al. patent. One can speculate about phosphoric acid neutralization as used by O'Connor et al. at the high oxide dilution levels as the Examiner does; however, there is no data that will allow one skilled in the art to extrapolate from the teachings of O'Connor et al. with any confidence.

Further, O'Connor et al. at col. 7, lines 15-20, assert that it is not possible to use glycerin with their invention, whereas the instantly claimed invention provides a useful process for the production of polyols using glycerin. O'Connor et al. disclose a procedure to allow the use of many starters with their dilution of the starter with very high levels of alkylene oxide. However, their method of using PO at very high levels is inherently unsafe and can only be practiced in very small reactors with high cooling capability and then only with significant safety risk. In contradistinction, the instantly claimed invention is directed to a procedure that will allow the use of glycerin and other starters having hydroxyl groups in close proximity to be used in a safer manner in a larger reactor, thus providing a commercially viable process.

Therefore, Claims 1-10, 13-16, 18, 19, 33 and 34 are neither anticipated, nor rendered obvious, by U.S. Pat. No. 6,359,101 issued to O'Connor et al and the rejections thereof under 35 U.S.C. §§102(b)/103(a) should be reversed.

B. The Rejection under 35 U.S.C. §103(a) over McDaniel et al. is Improper

Claims 1-16, 18, 19, 33 and 34 have been rejected under 35 U.S.C. §103 as being unpatentable over U.S. Pat. No. 6,077,978 issued to McDaniel et al. As will be set forth below, Appellant submits that Claims 1-16, 18, 19, 33 and 34 are not rendered obvious by the cited art and the rejection should be reversed.

1. The Examiner's Rationale

The Examiner has alleged at page 5, paragraph numbered 8 of the Final Office Action mailed June 14, 2007 that,

> Regarding Claims 1-16, 18, and 19, McDaniel et al. disclose an almost identical process to claim ***(1)*** (Abstract; column 6, lines 48-58); wherein the starters of claims ***(2-4)*** are used (column 5, lines 25-39; column 7, lines 7-20); wherein the acids of claims ***(5-7)*** are used (column 6, lines 3-23); wherein the continuous reactor/conditions of claims ***(10-13)*** are used (column 7, lines 21-55); wherein the catalyst of claim ***(14)*** is used (Examples); wherein the alkylene oxide of claims ***(15-16)*** are used (Examples); wherein the approximate molecular weight range of claim ***(1)*** is produced (Examples); ***(18)*** wherein the process is continuous (column 7, lines 21- 55); and ***(19)*** wherein the process is semi-batch (column 7, lines 21-55).
>
> The teachings of McDaniel are deficient in that they fail to explicitly disclose the use of: ***(1)*** greater than 100 ppm of acid; ***(8)*** greater than 100 ppm to about 2,000 ppm of acid; and ***(9)*** about 200 ppm to about 300 ppm of acid, all based on the weight of the starter. McDaniel discloses, "*In general*, less than 100 ppm acid based on total low molecular weight starter need to be added," (column 6, lines 55-58).
>
> McDaniel et al. establish that this concentration is a result-effective variable, wherein a minimum is required to prevent de-activation of the DMC catalyst (column 5, lines 3-24). Their general teaching of less than 100 ppm is open to possible ranges above 100 ppm. Furthermore, applicant fails to show criticality for the lower end-points of the claimed ranges.
>
> In light of this, it has been found that, "[Wlhere the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation," -*In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); and, "A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation," - *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).
>
> Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the acid concentration in the process of McDaniel et al. because McDaniel et al. establish that this concentration is a result-effective variable, wherein a minimum is required to prevent de-activation of the DMC catalyst. Furthermore, applicant fails to demonstrate criticality for the claimed ranges.
>
> Further with respect to the range of claim ***(1)***, the claimed range of greater than 100 ppm potentially abuts the disclosed range of less than

100 ppm. Even if these ranges do not touch or overlap, it has been found that a *prima facie* case of obviousness exists where, "the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties," - *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985) (Court held as proper a rejection of a claim directed to an alloy of "having 0.8% nickel, 0.3% molybdenum, up to 0.1 % iron, balance titanium" as obvious over a reference disclosing alloys of 0.75% nickel, 0.25% molybdenum, balance titanium and 0.94% nickel, 0.31% molybdenum, balance titanium.).

In addition, it should be noted that if these obvious amounts of acid were used in the process of McDaniel et al. one of ordinary skill in the art would have expected to yield the same molecular weight ranges set forth in claim ***(1)*** (*of about 260 Da to about 2,500 Da*). The use of these obvious amounts would yield the same or an obvious process of the one set forth in the claims. This same or obvious process would be expected to inherently produce the same or obvious results.

Regarding- Claims 33 and 34, the teachings of McDaniel et al. are as set forth above and incorporated herein to satisfy the limitations of claims 33 and 34.

2. The Claimed Processes are Patentably Distinguishable from the Cited Reference

Appellant disagrees with the Examiner's arguments reproduced above regarding McDaniel et al. and respectfully remind the Board of the Federal Circuit's admonition given against hindsight reconstruction in *In re Rouffet*, 149 F.3d 1350, 1357, 47 U.S.P.Q.2d 1453, 1458-9 (Fed. Cir. 1998) that, "...the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed." Appellant respectfully contends that the Examiner has failed to do so in the instant case.

McDaniel et al. demonstrate that the addition of acid neutralizes alkaline residues and aids in the production of polyols based on glycerin and other starters. They nowhere state or suggest that the addition of acid beyond that required for neutralization (what the Examiner refers to above as "obvious amounts of acid") provides any benefit. McDaniel et al. thus provide no teaching or guidance to one of ordinary skill in the art to even attempt such an addition.

Based upon the example of the instant application, the Appellant has discovered that it appears that there is a synergism between the DMC catalyst and the excess acid addition acid addition. The 60 ppm of acid added in the control is more than sufficient to neutralize the basic components in glycerin; however, the process fails in the production of a 700 MW polyol. The Appellant theorizes that the higher level of acid offsets the presence of water in the glycerin and/or offsets the problem, identified at col. 7 lines 15-20 of O'Connor et al., that is normally associated with starters having multiple hydroxyl groups in close proximity.

Thus, the cited reference fails to render obvious Claims 1-16, 18, 19, 33 and 34 and therefore the rejections thereof under 35 U.S.C. §103(a) should be reversed.

C. The Rejection under 35 U.S.C. §103(a) over O'Connor et al. in view of McDaniel et al. is Improper

Claims 11 and 12 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Pat. No. 6,359,101 issued to O'Connor et al. in view of U.S. Pat. No. 6,077,978 issued to McDaniel et al. As will be set forth below, Appellants submit that Claims 11 and 12 are not rendered obvious by the cited combination of art and the rejections thereof should be reversed.

1. The Examiner's Rationale

The Examiner has alleged at page 7, paragraph numbered 9 of the Final Office Action mailed June 14, 2007 that,

> The teachings of both O'Connor et al. and McDaniel et al. are as set forth above and incorporated herein. The teachings of O'Connor et al. disclose a continuous reaction; however, they fail to explicitly disclose: ***(11)*** the use of a tubular reactor; and ***(12)*** the use of multi-point addition for introducing the reactants.
>
> The analogous nature of these two references is readily established in light of the prior art rejections set forth above. In light of this, the teachings of McDaniel et al. establish that these limitations are recognized in the art as suitable reactors and feed techniques (*see column 7, lines 21-55*) for this type of continuous reaction.
>
> Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a tubular reactor and multi-point addition, as taught by McDaniel et al., in the process of O'Connor et al. because the teachings of McDaniel et al. establish that these limitations are recognized in the art at suitable reactors and feed techniques for this type of continuous reaction.

2. The Claimed Processes are Patentably Distinguishable from the Cited Combination of References

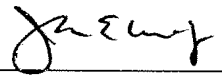
Appellant's assertions with respect to the deficiencies of each of O'Connor et al. and McDaniel et al. have been given above in connection with rejections based upon the individual references and will not be repeated here in the interests of conserving the Board's time. O'Connor et al. fail to teach or suggest the instantly claimed invention. McDaniel et al. fail to teach or suggest the instantly claimed invention. The combination of references fails to remedy the shortcomings of each in such a manner as to lead one of ordinary skill in the art to the instantly claimed invention.

Thus, the cited combination of references fails to render obvious Claims 11 and 12 and therefore the rejections thereof under 35 U.S.C. §103(a) should be reversed.

D. Conclusions

Therefore, for the reasons set forth above, the rejections of Claims 1-16, 18, 19, 33 and 34 under 35 U.S.C. §§102(b) and 103(a) are erroneous and the Board's reversal of those rejections is respectfully requested.

Respectfully submitted

By 

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VIII. CLAIMS APPENDIX

Claim 1. A process for the polyoxyalkylation of a starter comprising:

establishing oxyalkylation conditions in an oxyalkylation reactor in the presence of a double metal cyanide (DMC) catalyst;

continuously introducing into the reactor at least one alkylene oxide and a low molecular weight starter acidified with at least one of an inorganic protic mineral acid and an organic acid, wherein the acid comprises greater than 100 ppm, based on the weight of the starter; and

recovering an oxyalkylated low molecular weight starter polyether product having a number average molecular weight of about 260 Daltons (Da) to about 2,500 Da.

Claim 2. The process according to Claim 1, wherein the starter is chosen from glycerine, diglycerol and polyglycerol.

Claim 3. The process according to Claim 1, wherein the starter is glycerine.

Claim 4. The process according to Claim 1, wherein the starter is chosen from ethylene glycol, propylene glycol, dipropylene glycol, trimethylol-propane, pentaerythritol, sorbitol and sucrose.

Claim 5. The process according to Claim 1, wherein the acid is chosen from mineral acids, organic carboxylic acids, phosphonic acids, sulfonic acids and combinations thereof.

Claim 6. The process according to Claim 1, wherein the acid is chosen from citric acid, 1,3,5-benzene tricarboxylic acids, phosphonic acids, p-toluenesulfonic acid, hydrochloric acid, hydrobromic acid, sulfuric acid, formic acid, oxalic acid, citric acid, acetic acid, maleic acid, maleic anhydride, succinic acid, succinic anhydride,

adipic acid, adipoyl chloride, adipic anhydride, thionyl chloride, phosphorous trichloride, carbonyl chloride, sulfur trioxide, thionyl chloride phosphorus pentoxide, phosphorous oxytrichloride and combinations thereof.

Claim 7. The process according to Claim 1, wherein the acid is phosphoric acid.

Claim 8. The process according to Claim 1, wherein the acid comprises greater than 100 ppm to about 2,000 ppm, based on the weight of the starter.

Claim 9. The process according to Claim 1, wherein the acid comprises about 200 ppm to about 300 ppm, based on the weight of the starter.

Claim 10. The process according to Claim 1, wherein the reactor is a continuous reactor.

Claim 11. The process according to Claim 10, wherein the continuous reactor comprises a tubular reactor.

Claim 12. The process according to Claim 10, wherein the step of continuously introducing the at least one alkylene oxide and the low molecular weight starter comprises multi-point addition.

Claim 13. The process according to Claim 10, wherein the continuous reactor comprises a back-mixed reactor.

Claim 14. The process according to Claim 1, wherein the DMC catalyst is a zinc hexacyanocobaltate.

Claim 15. The process according to Claim 1, wherein the alkylene oxide is chosen from ethylene oxide, propylene oxide, oxetane, 1,2- and 2,3-butylene oxide, isobutylene oxide, epichlorohydrin, cyclohexene oxide, styrene oxide and C_5-C_{30} α-alkylene oxides.

Claim 16. The process according to Claim 1, wherein the alkylene oxide is propylene oxide.

Claim 18. The process according to Claim 1, wherein the process is continuous.

Claim 19. The process according to Claim 1, wherein the process is semibatch.

Claim 33. In a process of producing a polyurethane by the reaction of at least one isocyanate and at least one isocyanate reactive compound, the improvement comprising producing the isocyanate reactive compound by establishing oxyalkylation conditions in an oxyalkylation reactor in the presence of a double metal cyanide (DMC) catalyst, continuously introducing into the reactor at least one alkylene oxide and a low molecular weight starter acidified with at least one of an inorganic protic mineral acid and an organic acid, wherein the acid comprises in excess of 100 ppm, based on the weight of the low molecular weight starter and recovering an oxyalkylated low molecular weight starter polyether product having a number average molecular weight of about 260 Daltons (Da) to about 2,500 Da.

Claim 34. In a process of producing one of a coating, adhesive, sealant, elastomer and foam, the improvement comprising including the polyurethane according to Claim 33.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.